

**Indian Network for Climate Change Assessment [INCCA]**

**National Workshop**

**GHG Emissions Profile 2007**

***Industry Sector***

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# *Industry Sector*

## ❖ Minerals

- ◆ Cement, Glass production, Ceramics

## ❖ Chemicals

- ◆ Ammonia, nitric acid, carbides, titanium oxide, methanol, ethylene, EDC, VCM production, carbon black, caprolactam

## ❖ Metal

- ◆ Iron & steel, ferro alloys, aluminum, lead, zinc and copper

## ❖ Other industry sectors

- ◆ Textiles, leather, F&B, food processing, pulp & paper, mining & quarrying, non-specified sectors

## ❖ Non-energy product use

- ◆ Lubricant, paraffin wax

# Methodology

<b>Secondary data collection</b>	<b>Primary data collection</b>	<b>Emissions calculation</b>
<ul style="list-style-type: none"><li>■ Websites, reports of India's planning bodies (e.g., Planning Commission), Ministries, etc.</li><li>■ Research publications</li><li>■ Trade magazines and sector association publications</li></ul>	<ul style="list-style-type: none"><li>■ Selection of apt sample size based on size, nature of industry</li><li>■ Questionnaire / survey of companies in selected sample</li><li>■ Telephonic interviews with related sector associations</li></ul>	<ul style="list-style-type: none"><li>■ IPCC 2006 Guidelines for GHG Inventorization</li><li>■ IPCC 1996 Revised Guidelines for GHG Inventorization</li></ul>

# Emission Factors ... 1/2

Category	Gas	EF	Source
Cement production	CO <sub>2</sub>	0.537 t [clinker]	CMA, 2010
Glass production	CO <sub>2</sub>	0.21 t [container glass]; (0.22 t - fibre glass, 0.03 t - specialty glass)	IPCC, 2006
Other sources of soda ash	CO <sub>2</sub>	0.41492 t [carbonate]	IPCC, 2006
Ammonia production	CO <sub>2</sub>	C content of NG: 99.5% C oxidation factor: 14.4 kg C/GJ	NatCom, 2004
		Fuel req't: 7.72-10.5 mn kcal/t NH <sub>4</sub>	FAI, 2009
Caprolactam production	N <sub>2</sub> O	9 kg [chemical]	IPCC, 2006
Carbide production	CO <sub>2</sub>	1.1 t [CaC <sub>2</sub> ]	IPCC, 2006
Titanium dioxide production	CO <sub>2</sub>	1.385 t [TiO <sub>2</sub> ]	IPCC, 2006 [avg.]
Methanol	CO <sub>2</sub>	0.67 t [methanol]	IPCC, 2006
	CH <sub>4</sub>	2.3 t [methanol]	IPCC, 2006
Ethylene	CO <sub>2</sub>	1.73 t [ethylene]	IPCC, 2006
	CH <sub>4</sub>	3 kg [ethylene]	IPCC, 2006
EDC & VCM	CO <sub>2</sub>	0.296 t [EDC]; 0.47 t [VCM]	IPCC, 2006

# Emission Factors ... 2/2

Category	Gas	EF	Source
Ethylene Oxide	CO <sub>2</sub>	0.863 t [EO]	IPCC, 2006
	CH <sub>4</sub>	1.79 kg [EO]	IPCC, 2006
Acrylonitrile	CO <sub>2</sub>	1.0 t [AcN]	IPCC, 2006
	CH <sub>4</sub>	0.18 kg [AcN]	IPCC, 2006
Carbon black	CO <sub>2</sub>	2.62 t [C black]	IPCC, 2006
	CH <sub>4</sub>	0.06 kg [C black]	IPCC, 2006
Iron & Steel production	CO <sub>2</sub>	1.46 t [BOF production]; 0.08 t [EAF]; 1.72 t [OHF]; 0.7 t [DRI]	IPCC, 2006
Ferro-alloys production	CO <sub>2</sub>	4.8 t [ferro-Si]; 1.5 t [ferro-Mn]	IPCC, 2006
	CH <sub>4</sub>	1.1 kg [ferro-Si]	
Aluminum	CO <sub>2</sub>	1.65 t [Al]	IPCC, 2006 [avg.]
Lead production	CO <sub>2</sub>	0.58 t [Imperial]; 0.25 t [Direct]; 0.2 t [secondary production]	IPCC, 2006
Zinc production	CO <sub>2</sub>	0.53 t [Pyro-metallurgical]	IPCC, 2006
Lubricant use	CO <sub>2</sub>	C content 20 t / TJ; 0.2 Ox. Dur. Use	IPCC, 2006
Paraffin wax use	CO <sub>2</sub>	C content 20 t / TJ; 0.2 Ox. Dur. Use	IPCC, 2006

# *Salient Features of Emission Data*

- ❖ Total GHG emissions: 412.55 million tons
- ❖ Divided by gas
  - ◆ 405.86 million t CO<sub>2</sub>
  - ◆ 0.15 million t CH<sub>4</sub>
  - ◆ 0.21 million t N<sub>2</sub>O
- ❖ Divided by sector
  - ◆ Minerals: 31.7%
  - ◆ Metals: 28.4%
  - ◆ Chemicals: 8.1%
  - ◆ Others [P&P, F&B, txtl, lthr, non-specific, etc.]: 30.4%

# *Emission Data: Minerals, Chemicals*

- ❖ Minerals total: 131 mn t CO<sub>2</sub>
  - ◆ Cement: 130 mn t
  - ◆ Glass & ceramics: 0.43 mn t
  - ◆ Soda ash use: 0.59 mn t
- ❖ Chemicals total: 33.5 mn t CO<sub>2</sub>
  - ◆ FF use + process
  - ◆ CO<sub>2</sub>: 27.89 mn t
  - ◆ CH<sub>4</sub>: 0.11 mn t
  - ◆ N<sub>2</sub>O: 0.17 mn t

# *Emission Data: Metals, Other*

- ❖ Metals total: 122.74 mn t
  - ◆ Iron & steel, Al, Pb, Zn, Mg, Ferro-alloys, Cu
  - ◆ CO<sub>2</sub>: 122.37 mn t
  - ◆ CH<sub>4</sub>, N<sub>2</sub>O: miniscule
- ❖ Others total: 124.5 mn t
  - ◆ Pulp & paper, F&B, textile, leather, mining, quarrying, non-specific
  - ◆ CO<sub>2</sub>: 123.9 mn t
  - ◆ CH<sub>4</sub>, N<sub>2</sub>O: miniscule



# *Emissions from Industry Sector*

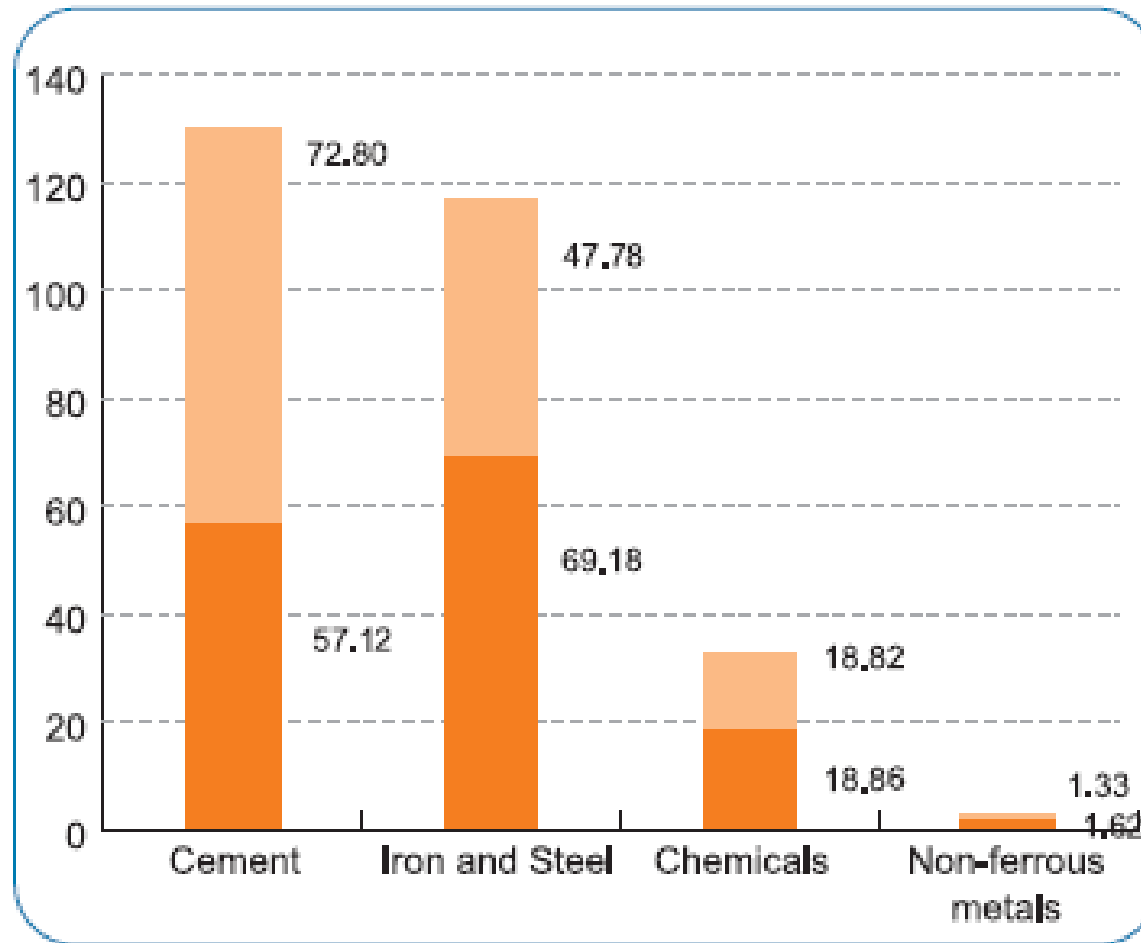


Figure 6.2: Relative CO<sub>2</sub> emissions in million tons due to fossil fuel combustion and process emissions in different industries